

# 5.5

## Exploring Ratios

**Focus** Use models and diagrams to investigate ratios.

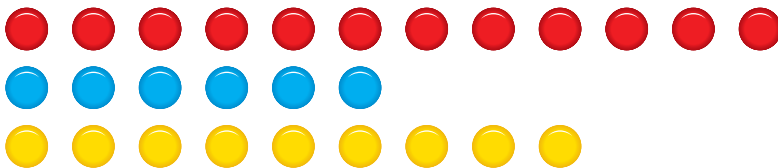
There are different ways to compare numbers.  
Look at these advertisements.



How are the numbers in each advertisement compared?  
Which advertisement is most effective? Why do you think so?

### Investigate

Work with a partner.



Compare the number of blue counters to the number of yellow counters.  
How many different ways can you compare the counters?  
Write each way you find.

### Reflect & Share

Share your list with another pair of classmates.  
Add any new comparisons to your list.  
Talk about the different ways you compared the counters.

## Connect

Here is a collection of sports balls.



- We can use a **two-term ratio** to compare one part of the collection to the whole collection.  
There are 7 basketballs compared to 20 balls.  
The ratio of basketballs to all the balls is 7 to 20, which is written as 7:20.

This is a **part-to-whole ratio**.

We can write a part-to-whole ratio as a fraction.  
The ratio of basketballs to all the balls is  $\frac{7}{20}$ .

A part-to-whole ratio can also be written as a percent:  $\frac{7}{20} = \frac{35}{100} = 35\%$   
So, 35% of the balls are basketballs.

- We can use a two-term ratio to compare one part of the collection to another part of the collection.  
There are 5 golf balls compared to 8 tennis balls.  
The ratio of golf balls to tennis balls is written as 5 to 8, or 5:8.  
We cannot write this ratio in fraction form because the ratio is not comparing one part to the whole.

This is a **part-to-part ratio**.

- We can use a **three-term ratio** to compare the three types of balls.  
There are 5 golf balls to 8 tennis balls to 7 basketballs.  
We can write this as the ratio:  
5 to 8 to 7, or 5:8:7

### Example

At a class party, there are 16 boys, 15 girls, and 4 adults.

Show each ratio as many different ways as you can.

- a) boys to girls
- b) boys to girls to adults
- c) adults to total number of people at the party

### A Solution

- a) There are 16 boys to 15 girls.

This is a part-to-part ratio.

So, the ratio of boys to girls is: 16 to 15, or 16:15

- b) There are 16 boys, 15 girls, and 4 adults.

So, the ratio of boys to girls to adults is: 16 to 15 to 4, or 16:15:4

- c) The total number of people is  $16 + 15 + 4 = 35$ .

There are 4 adults to 35 people.

This is a part-to-whole ratio.

So, the ratio of adults to total number of people is:

4 to 35; 4:35,  $\frac{4}{35}$ , or about 11.4%

### Discuss

### the ideas

1. What is the difference between a part-to-whole ratio and a part-to-part ratio?
2. In the *Example*, explain how the part-to-whole ratio of 4:35 can be written as about 11.4%.
3. In the *Example*, why were the ratios of boys to girls and boys to girls to adults *not* written in fraction form?

### Practice

#### Check

4. Write each part-to-whole ratio as a fraction.  
a) 5:8    b) 12:16    c) 4:9    d) 24:25
5. Write each part-to-whole ratio as a percent.  
a) 19:20    b) 12:15    c) 3:8    d) 5:6

6. Look at the candy-covered chocolates below. Explain what each ratio means.

- a) 3:5
- b) 7:5
- c) 5:15
- d) 3:5:7
- e) 3:12



7. Look at the golf balls below. Write each ratio in two different ways.



- orange golf balls to the total number of golf balls
- white golf balls to the total number of golf balls
- yellow golf balls to pink golf balls
- yellow golf balls to white golf balls to orange golf balls

### Apply

- The ratio of T-shirts to shorts in Frank's closet is 5:2.
  - Write the ratio of T-shirts to the total number of garments.
  - Write the ratio in part a as a percent.
- Write a part-to-part ratio to compare the items in each sentence.
    - A student had 9 green counters and 7 red counters on his desk.
    - In a dance team, there were 8 girls and 3 boys.
    - A recipe called for 3 cups of flour, 1 cup of sugar, and 2 cups of milk.
  - Write a part-to-whole ratio for the items in each sentence in part a. Express each ratio as many ways as you can.
- What is the ratio of boys to girls in your class?
  - What is the ratio of girls to boys?
  - What is the ratio of boys to the total number of students in your class? Write the ratio as a percent.
  - Suppose two boys leave the room. What is the ratio in part c now?
- A box contains 8 red, 5 green, 2 orange, 3 purple, 1 blue, and 6 yellow candies.
  - Write each ratio.
    - red:purple
    - green:blue
    - purple:blue:green
    - orange and yellow:total candies
  - Suppose 3 red, 2 green, and 4 yellow candies were eaten. Write the new ratios for part a.
- Suppose you were asked to tutor another student.
  - How would you explain  $\frac{2}{7}$  as a ratio?
  - What real-life example could you use to help?
- Draw two different diagrams to show the ratio 3:5.
  - Draw a diagram to show the ratio 7:1.
  - Draw a diagram to show the ratio 5:2:4.
  - Why can you draw 2 diagrams in part a, but not in parts b and c?

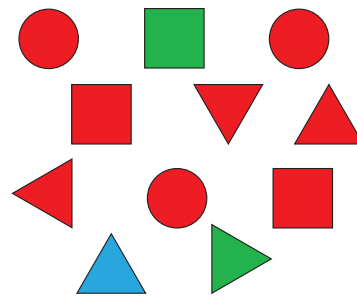
- 14. Assessment Focus** Patrick plans to make macaroni salad. The recipe calls for:
- 3 cups of cooked macaroni
  - 3 cups of sliced oranges
  - 2 cups of chopped apple
  - 1 cup of chopped celery
  - 2 cups of mayonnaise
- a) What is the total amount of ingredients?
  - b) What is each ratio?
    - i) oranges to apples
    - ii) mayonnaise to macaroni
    - iii) apples to mayonnaise to celery
  - c) What is the ratio of apples and oranges to the total amount of ingredients? Write this ratio as a fraction and as a percent.
  - d) Patrick uses 2 cups of oranges instead of 3. What are the new ratios in parts b and c?
  - e) Write your own ratio problem about this salad. Solve your problem.

- 15.** Look at the words below.
- |            |            |
|------------|------------|
| • ratio    | • percent  |
| • discount | • increase |
| • decimal  | • taxes    |
| • problem  | • number   |
- Which words represent the ratio 2:5?  
Explain what the ratio means each time.

- 16. Take It Further** Maria shares some cranberries with Jeff. Maria says, “Two for you, three for me, two for you, three for me ...” Tonya watches. At the end, she says, “So Jeff got  $\frac{2}{3}$  of the cranberries.” Do you agree with Tonya? Give reasons for your answer.



- 17. Take It Further**
- a) Create four different ratios using these shapes.



- b) How can you change one shape to create ratios 2:5 and 7:3? Explain.
- 18. Take It Further** Choose a vowel-to-consonant ratio. Find 3 words that represent this ratio.

## Reflect

Give 3 examples from your classroom that can be represented by the ratio 1:1.